area may be found in Appendix D.

There was insufficient time to include peak hour automobile trips generated for the past year's non-residential development approvals in this year's ADAC report. Due to the number of specialized trip generation rates used for the diverse types of non-residential land uses, reporting these data requires an individual review of hundreds of plan files. As more of this information is loaded with each case file into the development review database system, the ability to report on non-residential trip generation quickly and accurately should increase. Information on non-residential trip generation will appear in next year's ADAC report.

In general, non-residential trip generation, like residential trip generation, should mirror the location of the actual developments; however, more variation in the overall trip generation for non-residential development should be expected due to the diversity of uses and trip generation rates that reflect potential for trip chaining and other trip making behavior that is less uniform (in the aggregate) than that of residential development.

Montgomery County's transportation infrastructure constantly evolves to proactively respond to changing growth patterns. Figures 3.6 through 3.9 show the major construction projects and facility planning studies for the county contained in the State's Consolidated Transportation Program (CTP) and the County's Capital Improvement Program (CIP). Lists of the projects located on Figures 3.6 through 3.9 may be found in Appendices E through H.

The maps clearly illustrate that recent investment in transportation infrastructure improvements has closely tracked or anticipated future development, as a majority of the projects shown are located in the policy areas receiving the most new development shown in Figures 3.1 / 3.2 and 3.4 / 3.5. However, prioritizing future transportation improvements when resources are limited and growth is continuing in many parts of the county requires a different set of criteria than merely channeling transportation investment into growing areas. Decision makers also need to have information on how the existing transportation network is performing both in the growth areas and in the county as a whole, and should consider the county's planning goals as well.

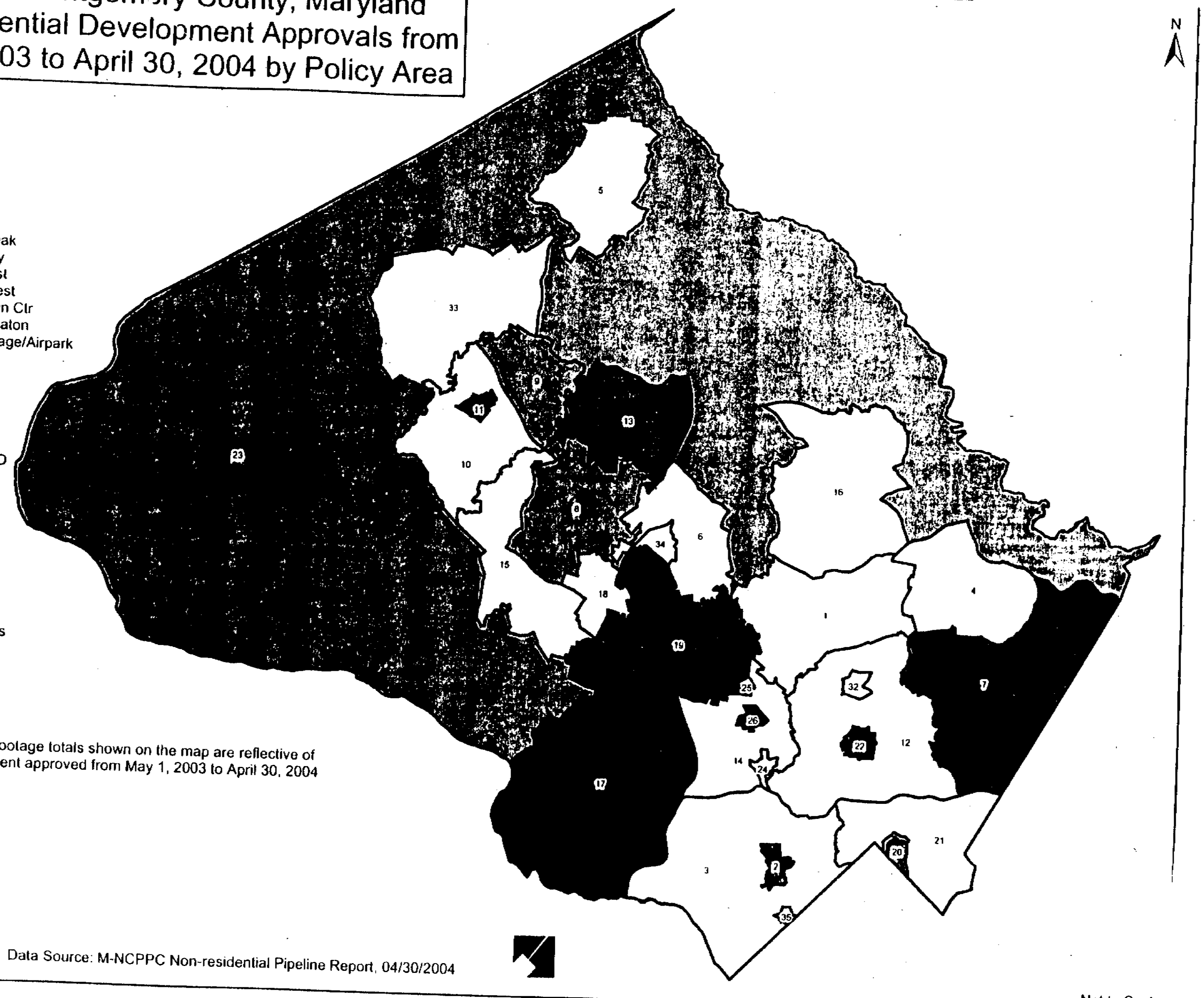
4. Primer on Measuring and Tracking Traffic Congestion

Measuring and tracking traffic congestion requires the consistent use of various transportation related performance measures. Performance measures for transportation should be similar to other familiar performance measures for worker productivity, industrial output, government effectiveness, or any other arena where performance measures are used for evaluation and investment decisions. The characteristics of a good performance measure apply broadly, regardless of what context they are applied to or what the desired outcome of each individual measure may be for the appropriate decision makers. A good performance measure is:

Understandable: How the performance measure is constructed, calculated, applied, and interpreted or analyzed should be easily comprehensible to decision-makers and the general public.

Figure 3.5: Montgomery County, Maryland Non-residential Development Approvals from May 1, 2003 to April 30, 2004 by Policy Area

1 = Aspen Hill
2 = Bethesda CBD
3 = Bethesda-CC
4 = Cloverly
5 = Damascus
6 = Derwood
7 = Fairland/White Oak
8 = Gaithersburg City
9 = Germantown East
10 = Germantown West
11 = Germantown Twn Ctr
12 = Kensington/Wheaton
13 = Montgomery Village/Airpark
14 = North Bethesda
15 = North Potomac
16 = Olney
17 = Potomac
18 = R&D Village
19 = Rockville City
20 = Silver Spring CBD
21 = SS/Takoma Park
22 = Wheaton CBD
23 = Rural
24 = Grosvenor
25 = Twinbrook
26 = White Flint
32 = Glenmont
33 = Clarksburg
34 = Shady Grove
35 = Friendship Heights



*Square-footage totals shown on the map are reflective of development approved from May 1, 2003 to April 30, 2004

TOTAL SQUARE-FT
0 - 4000
4001 - 31160
31161 - 83466
83467 - 377402
377403 - 1345398

Data Source: M-NCPPC Non-residential Pipeline Report, 04/30/2004

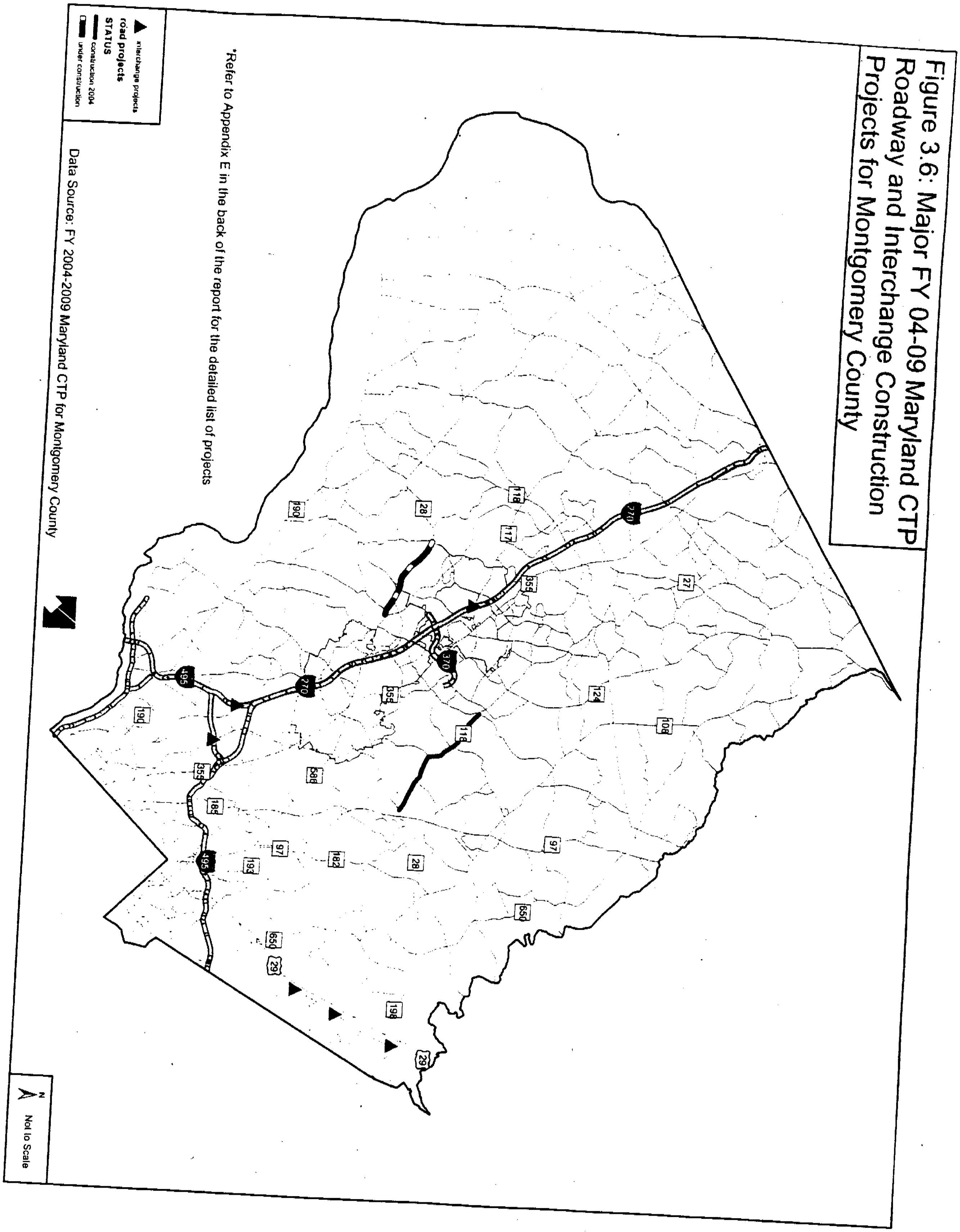


Figure 3.6: Major FY 04-09 Maryland CTP Roadway and Interchange Construction Projects for Montgomery County

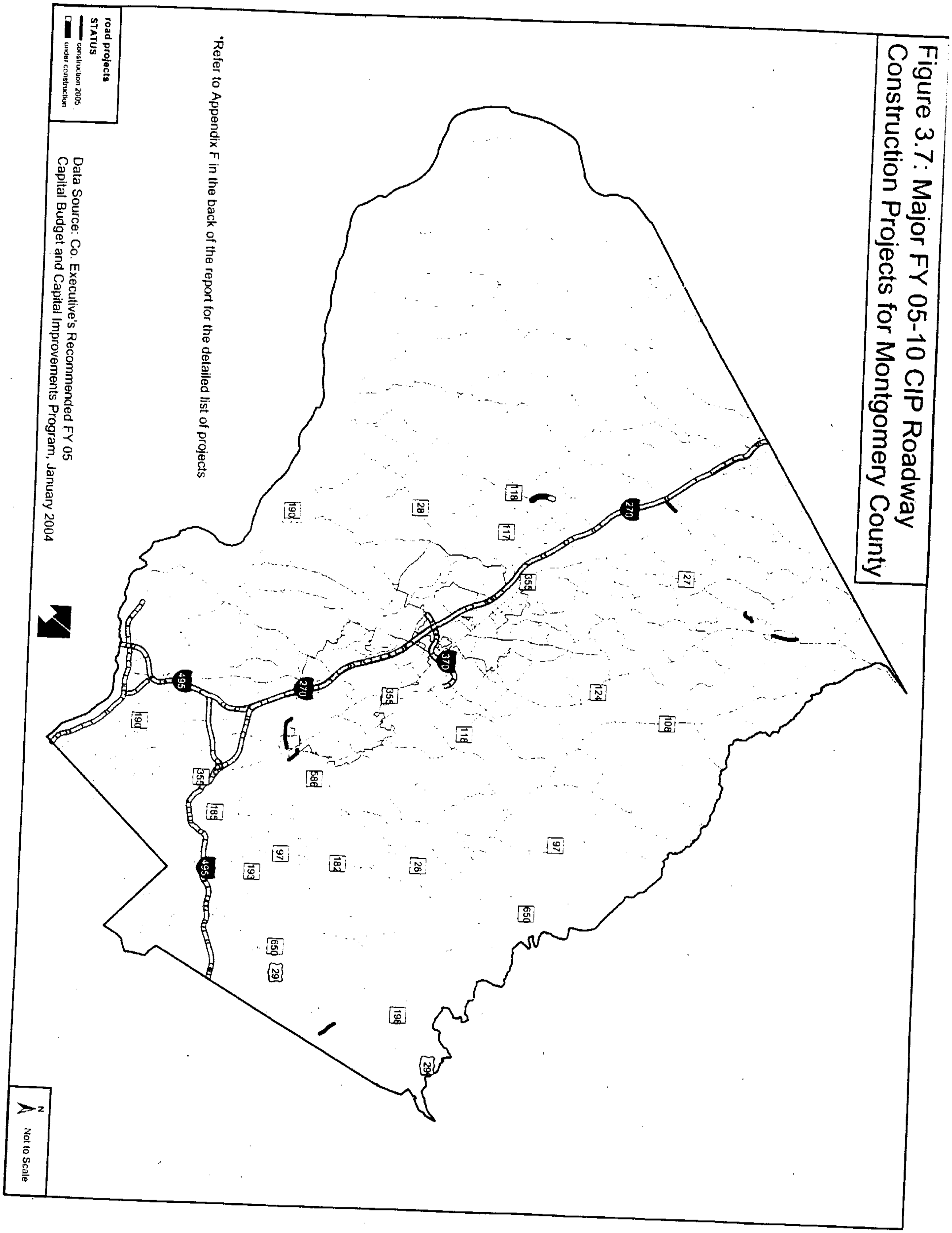


Figure 3.7: Major FY 05-10 CIP Roadway Construction Projects for Montgomery County

*Refer to Appendix F in the back of the report for the detailed list of projects

Data Source: Co. Executive's Recommended FY 05 Capital Budget and Capital Improvements Program, January 2004

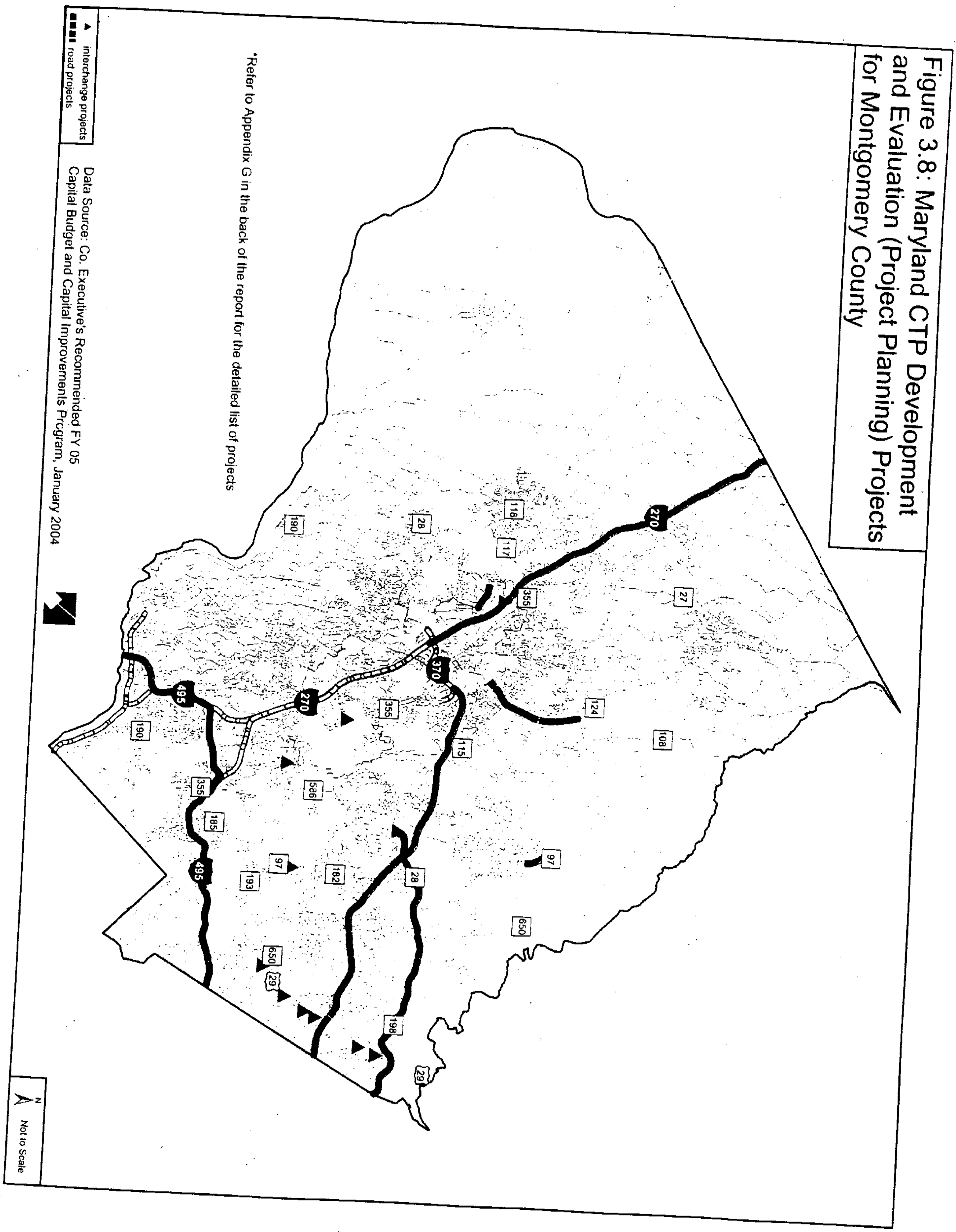
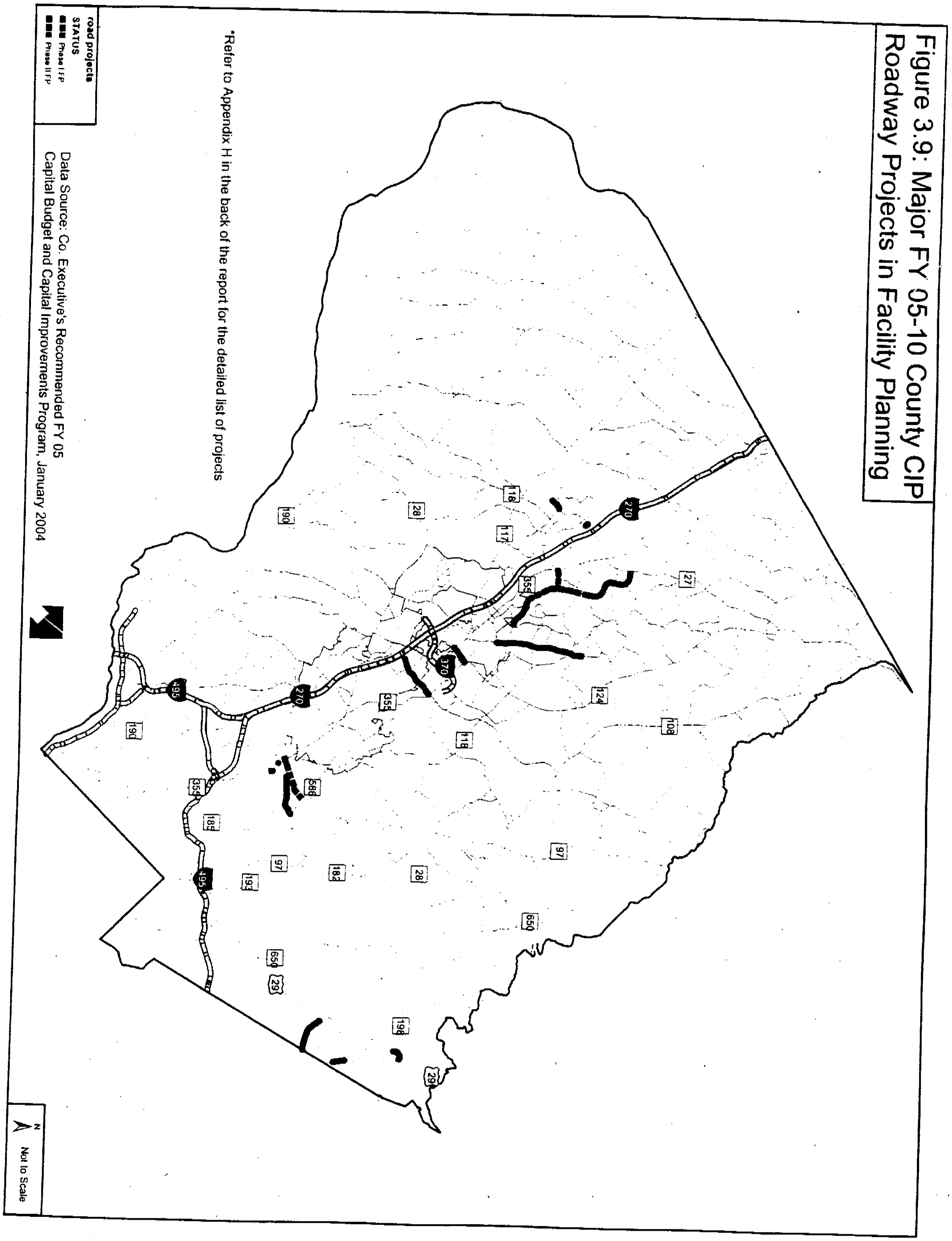


Figure 3.8: Maryland CTP Development and Evaluation (Project Planning) Projects for Montgomery County

Figure 3.9: Major FY 05-10 County CIP Roadway Projects in Facility Planning



*Refer to Appendix H in the back of the report for the detailed list of projects

Data Source: Co. Executive's Recommended FY 05 Capital Budget and Capital Improvements Program, January 2004

Reliable: A performance measure should produce consistent results from observation to observation under controlled conditions or absent other significant change factors.

Reproducible: A good performance measure will generally yield the same results if measured the same way under the same conditions repeatedly.

Relevant: A good performance measure is on topic and on target.

While characteristics of a good performance measures apply broadly, what is actually *being* measured is particularly specific to the area of interest. This report measures the following characteristics:

Growth: Where, how many, and how quickly are jobs and people being added to the county?

Infrastructure: Where, how many, and what type of transportation facilities, residential structures, and non-residential structures are being added to the county?

Mobility: How can residents, workers, and visitors move around the county?

Congestion: Where, when, and to what degree is movement limited or impeded?

Utilization: How much travel is occurring in the county, by whom, to where, and by what mode?

Performance measures may either be quantitative or qualitative. Some transportation-based measures may be expressed both quantitatively and qualitatively – a volume-to-capacity ratio (V/C ratio) on a roadway link of 0.95 may also be assigned a letter grade of A to F corresponding with a level of service (LOS), or simply that a link is "badly congested." Transportation-based performance measures may also be rooted in two different perspectives of the transportation system – (1) the "bird's-eye" perspective of the system provider, which examines component parts of the system in relation to the overall functionality of the entire transportation system, and (2) the "worm's-eye" perspective of individual system users who are actually experiencing the system conditions over many but not all parts of the system while traveling on their journeys. Reviewing results of both qualitative and quantitative performance measures from both the provider and user perspectives is crucial to a well-balanced analysis of the transportation system that yields effective decision-support information.

Finally, an important thing to remember about performance measures is that their usefulness is vastly diminished if only reviewed a single time for a single set of decision-making. The power in performance measurement lies in consistent analysis over time and revisiting both the data and the actual measures periodically. The annual Urban Mobility Study issued by the Texas Transportation Institute (TTI) is a popular report that uses transportation performance measures to analyze overall, area-wide congestion in U.S. metropolitan areas.

The Urban Mobility Study is a good study in the effective use of transportation performance measures: it provides understandable results, gives fairly clear information about its performance measures, including data collection and calculation methodologies and shows changes to the measure set over time. But most importantly, the TTI report is an annual report; by reporting the same type of information in the same type of way each year, each metropolitan area can track its performance over time: i.e., is congestion getting better or worse (and why?). However, the TTI report has its flaws in that it looks at the Washington region and not specifically at Montgomery County, only considers peak periods, and relies on one main data source that at times consists not of direct observations, but rather estimated values.

The process of periodically studying all this information and reporting the results is called congestion tracking. While the term congestion monitoring generally refers to the continuous uses of various traffic flow detectors to determine short-term changes in traffic conditions, it is also being used here to mean the periodic monitoring or the use of samples of such monitoring data.

The Annual Growth Policy legislation says that the draft annual growth policy must include a status report that includes the level of service conditions on major public facilities and other relevant monitoring measures. Thus, direct congestion tracking for planning purposes represents a refined mission for the Council. In order to best achieve this refined mission, it is worth exploring the specific characteristics of congestion that are useful to monitor. In general, the more usable the available travel data, the better the monitoring and the more informed the decision-making. However, the data must be sufficiently reliable to be useful for analytic purposes, and too much data can be impossible to process for analysis into information. It is quite possible to effectively "drown" in data, and the appropriate level of data to use depends on both the purpose of the analysis and the comfort level and expectations of the audience. In general, the following characteristics of congestion are desirable to study through a congestion tracking or monitoring program:

Spatial / Geographic Extent: What area(s) of the county are congested? Are those areas a series of intersections, roadway links, an entire facility, or a central business district? Does the congestion occur in specific directions and/or between specific pairs of origins and destinations? Answering these questions requires wide geographic coverage in data samples.

Operational Intensity: How bad is the congestion? What are the standards to determine the severity of the congestion? How many signal cycles does it take to get through a congested intersection? Answering these questions requires data with a fine level of granularity and detail.

Temporal Duration: Is congestion limited to well-defined peak periods? Is there "peak spreading?" How many hours of congested conditions occur in a typical day? Answering these questions requires data that are both fine-grained and collected over a wide period of time.

Concurrent Variability Over Time and Space: From a congestion standpoint, what constitutes a typical day for the transportation system? Is there such a thing as a typical day? What are the fluctuations in the congestion patterns? Answering these questions requires data that are fine-grained, collected over a wide period of time, and collected over a wide area.

Recurrent and non-recurrent causality: Are congested areas being caused by recurring bottlenecks or by recurring incidents (i.e., a weave area that has a high rate of crashes), or by random incidents?

The success of a traffic congestion tracking and monitoring effort depends on how the available data and selected measures respond to the spatial-temporal, statistical, and point-of-view criteria for congestion measures, and how that data adheres to the overall characteristics of good performance measures. All of the measures in this report use observed data, except for one that uses forecasting results from the Department's travel demand model, TRAVEL/2 (which is validated using observed data).

5. Current Congestion (Observed Data)

Simply stated, congestion is too many people and/or vehicles in the same general place at the same general time. When the physical space for movement is constrained, or alternatively used as at intersections, the movement slows, sometimes stops, and queues often develop so that the people and vehicles can safely move in a proper turn.

There are more than 3,200 miles of state, county, and municipal roads in the County with over 750 signalized intersections. Directly measuring such congestion at all places at all times would be a Herculean task as would be the analysis and summary of the vast amount of data. As such this report uses different performance measures that sample the use of the roadway network from different data sources at different places and times to be able to estimate and report on the extent, intensity, duration, variability, and causality of congestion. Six measures included in this report and their respective data sources follow below:

- Critical Lane Volumes (CLVs) at signalized intersections from the Park and Planning Database

- Intensity of Arterial Use from the County's Advanced Transportation Management System (ATMS) traffic volume data, archived in Park and Planning's Data Acquisition Software and Hardware (DASH) system

- Average Freeway Speeds and Travel Times from MWCOG-Skycomp

- Route-Specific Arterial Travel Times and Speeds from GPS probes of MWCOG and by Motion Maps LLC for the report

- Monitored Freeway Speeds and Travel Times from the State's Coordinated Highways Reponse Action Team (CHART) data archive by the University of Maryland Center for Advanced Transportation Technology (UMD-CATT).

- Short-Range Forecasted (year 2010) V/C ratio and average speeds from the Park and Planning TRAVEL/2 Model